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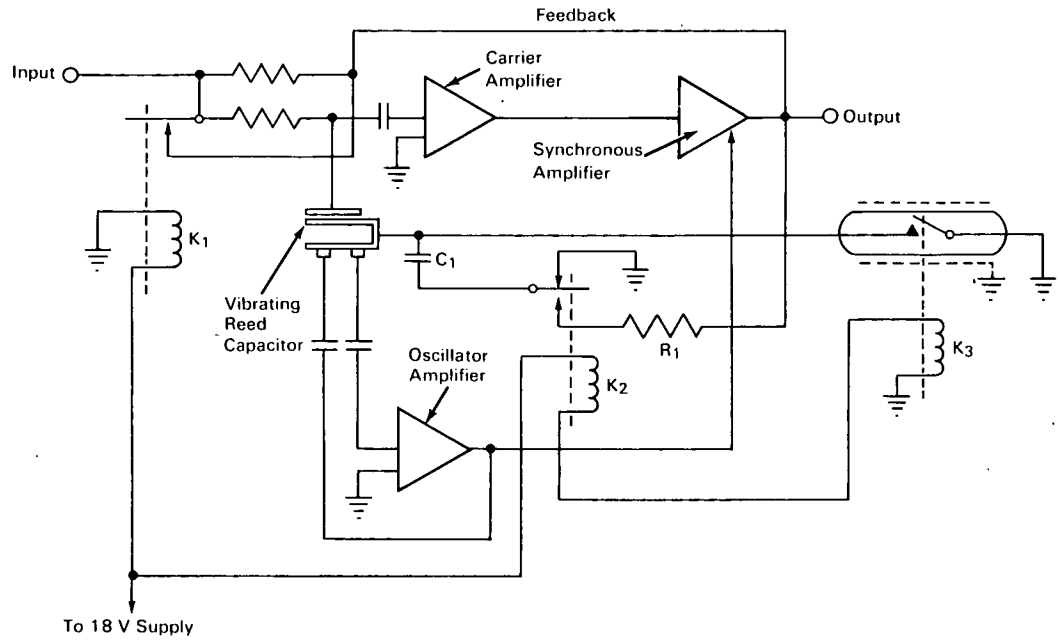
Brief 65-10242

NASA TECH BRIEF

Electrometer Has Automatic Zero Bias Control



The problem: In a vibrating reed type electrometer, the vibrating reed has a residual (or contact) potential acting across it. This potential must be counterbalanced in order that the instrument may read zero output potential in the absence of an input current. Because this potential is in the order of 5×10^{-4} volts/°C, and because the instrument is designed to operate over a temperature range of 0 to 60°C with long term stability of 5 mv or better, there is need for a dynamic zero balancing or standardization circuit.

The solution: A zero biasing circuit that charges a capacitor to the contact potential and then connects that capacitor in series with the vibrating reed so that the voltages cancel.

How it's done: To standardize the unit, the 3 relay coils K_1, K_2, and K_3 are energized. This connects capacitor C_1 to the output of the synchronous amplifier through resistor R_1. Capacitor C_1 then charges to a value very close to the zero error of the vibrating reed. The input of the instrument is connected to the feedback loop to establish a zero reference by the action of K_1. The three relays are then deenergized. Relay K_3 opens before K_2 completes its transfer to avoid shorting out C_1. Capacitor C_1 is now connected in series with the vibrating element and ground in the correct polarity to cancel the zero error potential. The opening of K_1 enables the instrument to accept the next input signal. The value of the time constant R_1C_1 determines the degree of standardization attained.

(continued overleaf)

Notes:

1. Ripple voltage across C_1, resulting from the carrier signal and the synchronous rectifier, is inversely proportional to the time constant R_1C_1. In controlling this ripple component, the time constant must not be extended to excessively delay the standardization operation.

2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Goddard Space Flight Center
   Greenbelt, Maryland, 20771
   Reference: B65-10242

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: Applied Physics Corporation
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Goddard Space Flight Center
(GSFC-350)